Claims

1. Subsea excavation and suction device comprising a suction head (1) that is movably attached to a hydraulic controller arm (13) and has an inlet opening (3) at a free, outer end and an outlet opening (12) attached to a suction hose (10) arranged at a distance from the inlet opening (3), said suction head (1) having means for disintegration solid material and having a larger cross-sectional area at the inlet opening (3) than at the outlet opening (12), characterized in that the suction head (1) comprises both hydraulic and mechanic means to disintegrate solid material, where the hydraulic means comprises a number of primary jet nozzles arranged along the edge (6) surrounding the inlet opening (3) and having fluid communication with a source of pressurized liquid while the mechanic means comprises at least one bar (4, 5) dividing the inlet opening (3) into inlet sections (3i), said at least one bar being shaped and dimensioned to effect a mechanic disintegration of solid material (sediment).

2. Device as claimed in claim 1, characterized in that at least one of the edges (6_1-6_4) is shaped and dimensioned to act to mechanically disintegrate solid material.

3. Device as claimed in claim 2, characterized in that all edges (6_1-6_4) are shaped and dimensioned to act to mechanically disintegrate solid material.

4. Device as claimed in claims 1-3, characterized in that a number of the primary jet nozzles (7) are arranged to purge in a direction substantially straight ahead from the inlet opening (3), i.e. in a direction mainly opposite to the direction of movement of material (sediment) being sucked into the inlet opening (3).

5. Device as claimed in claims 1-4, characterized in that a number of the primary jet nozzles (7) are arranged parallel with each other and arranged so close to one another that a substantially smooth cutting edge in the sediment is obtained during use.

6. Device as claimed in claims 1-5, characterized in that a number of secondary jet nozzles (15) are arranged within the suction head (1) to further disintegration of sediment, said secondary jet nozzles (15) having fluid connection with a pressurized liquid and being arranged mainly perpendicular to the direction of movement for the sediment being sucked into the inlet opening (3).

7. Device as claimed in claims 1-6, characterized in that at least some of the primary (7) and/ or secondary jet nozzles (15) are comprised by holes bored along a line in parts of the supply pipe (18) for liquid from the mentioned pressurized liquid source.

8. Device as claimed in claims 1-7, **characterized in** that at least some of the primary nozzles (7) are arranged in wedge-like teeth (16) that extend from around the inlet opening (3) of the suction head.

9. Device as claimed in claims 1-7, **characterized in** that at least some of the primary nozzles (7) are arranged in a wedge-like edge that extends from around the inlet opening of the suction head.

10. Device as claimed in anyone of the preceding claims, **characterized in** that at least some of the bars (4, 5) are provided with primary jet nozzles (7).

11. Device as claimed in anyone of the preceding claims, **characterized in** that the cross-sectional area of said inlet sections (3i) are substantially equal and not larger than the cross-sectional area of the outlet opening (12).

12. Device as claimed in anyone of the preceding claims, **characterized in** that said bars (4 or 5) divide the inlet opening (3) of the suction head(1) into sections in a grid pattern in one direction.

13. Device as claimed in anyone of the preceding claims, **characterized in** that said bars (4 or 5) divide the inlet opening (3) of the suction head(1) into sections in a grid pattern in two directions.

14. Device as claimed in anyone of the preceding claims, **characterized in** that secondary nozzles (15) for proving jet streams mainly across the direction of movement of solid material being sucked into suction head (1) are arranged near outlet opening (12) in suction head (1).

15. Device as claimed in anyone of the preceding claims, **characterized in** that a backflush nozzle is arranged near the outlet opening (12) in order to be able to temporarily reverse the direction of transportation trough suction hose (10).

16. Device as claimed in anyone of the preceding claims, **characterized in** that the suction hose (10) is provided with a sideways opening or valve that opens at a predetermined underpressure, so that the suction force and thereby the risk of clogging is reduced.

17. Device as claimed in anyone of the preceding claims, **characterized in** that the inlet opening (3) of the suction had (1) has a cross-sectional area that is chosen so that the average water velocity through inlet opening (3) is at least 30% of the water velocity through outlet opening (12).

18. Device as claimed in claims 1-17, **characterized in** that the inlet opening (3) of the suction had (1) has a cross-sectional area that is chosen so that the average water velocity through inlet opening (3) is at least 50% of the water velocity through outlet opening (12).

19. Device as claimed in anyone of the preceding claims, **characterized in** that the hydraulic controller arm (13) has an outer telescopic arm for linear cenveying of the suction head.

20. Device as claimed in anyone of the preceding claims, characterized in that the hydraulic controller arm (13) has a movability that allows the suction head (1) to be moved sideways or rotated.

21. Device as claimed in anyone of the preceding claims, characterized in that the suction force in the suction head (10) is provided by means of an ejector with one or more ejector nozzles arranged angularly (aslant) outside the cross-section of the suction hose (10).

22. Device as claimed in anyone of the preceding claims, characterized in that the device is mounted on or comprises a full track chassis (22).

23. Device as claimed in claim 22, characterized in that the chassis (22) comprises a platform (23) which is pivotal about a gear rim or the like.

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Claims

1. Subsea excavation and suction device for complete submersion comprising a suction head (1) that is movably attached to a hydraulic controller arm (13) and has an inlet opening (3) at a free, outer end and an outlet opening (12) attached to a suction hose (10) arranged at a distance from the inlet opening (3), said suction head (1) having means for disintegration solid material and having a larger cross-sectional area at the inlet opening (3) than at the outlet opening (12), **characterized in** that the suction head (1) comprises both hydraulic and mechanic means to disintegrate solid material, where the hydraulic means comprises a number of primary jet nozzles arranged along the edge (6) surrounding the inlet opening (3) and having fluid communication with a source of pressurized liquid while the mechanic means comprises at least one bar (4, 5) dividing the inlet opening (3) into inlet sections (3i), said at least one bar being shaped and dimensioned to effect a mechanic disintegration of solid material (sediment).

2. Device as claimed in claim 1, **characterized in** that at least one of the edges (6_1-6_4) is shaped and dimensioned to act to mechanically disintegrate solid material.

3. Device as claimed in claim 2, **characterized in** that all edges (6_1-6_4) are shaped and dimensioned to act to mechanically disintegrate solid material.

4. Device as claimed in anyone of claims 1-3, **characterized in** that a number of the primary jet nozzles (7) are arranged to purge in a direction substantially straight ahead from the inlet opening (3), i.e. in a direction mainly opposite to the direction of movement of material (sediment) being sucked into the inlet opening (3).

5. Device as claimed in anyone of claims 1-4, **characterized in** that a number of the primary jet nozzles (7) are arranged parallel with each other and arranged so close to one another that a substantially smooth cutting edge in the sediment is obtained during use.

6. Device as claimed in anyone of claims 1-5, **characterized in** that a number of secondary jet nozzles (15) are arranged within the suction head (1) to further disintegration of sediment, said secondary jet nozzles (15) having fluid connection with a pressurized liquid and being arranged mainly perpendicular to the direction of movement for the sediment being sucked into the inlet opening (3).

7. Device as claimed in anyone of claims 1-6, **characterized in** that at least some of the primary (7) and/ or secondary jet nozzles (15) are comprised by holes bored along a line in parts of the supply pipe (18) for liquid from the mentioned pressurized liquid source.

8. Device as claimed in anyone of claims 1-7, **characterized in** that at least some of the primary nozzles (7) are arranged in wedge-like teeth (16) that extend from around the inlet opening (3) of the suction head.

9. Device as claimed in anyone of claims 1-7, **characterized in** that at least some of the primary nozzles (7) are arranged in a wedge-like edge that extends from around the inlet opening of the suction head.

10. Device as claimed in anyone of the preceding claims, **characterized in** that at least some of the bars (4, 5) are provided with primary jet nozzles (7).

11. Device as claimed in anyone of the preceding claims, **characterized in** that the cross-sectional area of said inlet sections (3i) are substantially equal and not larger than the cross-sectional area of the outlet opening (12).

12. Device as claimed in anyone of the preceding claims, **characterized in** that said bars (4 or 5) divide the inlet opening (3) of the suction head(1) into sections in a grid pattern in one direction.

13. Device as claimed in anyone of the preceding claims, **characterized in** that said bars (4 or 5) divide the inlet opening (3) of the suction head(1) into sections in a grid pattern in two directions.

14. Device as claimed in anyone of the preceding claims, **characterized in** that secondary nozzles (15) for proving jet streams mainly across the direction of movement of solid material being sucked into suction head (1) are arranged near outlet opening (12) in suction head (1).

15. Device as claimed in anyone of the preceding claims, **characterized in** that a backflush nozzle is arranged near the outlet opening (12) in order to be able to temporarily reverse the direction of transportation trough suction hose (10).

16. Device as claimed in anyone of the preceding claims, **characterized in** that the suction hose (10) is provided with a sideways opening or valve that opens at a predetermined underpressure, so that the suction force and thereby the risk of clogging is reduced.

17. Device as claimed in anyone of the preceding claims, **characterized in** that the inlet opening (3) of the suction had (1) has a cross-sectional area that is chosen so that the average water velocity through inlet opening (3) is at least 30% of the water velocity through outlet opening (12).

18. Device as claimed in anyone of claims 1-17, **characterized in** that the inlet opening (3) of the suction had (1) has a cross-sectional area that is chosen so that the average water velocity through inlet opening (3) is at least 50% of the water velocity through outlet opening (12).

19. Device as claimed in anyone of the preceding claims, **characterized in** that the hydraulic controller arm (13) has an outer telescopic arm for linear conveying of the suction head.

20. Device as claimed in anyone of the preceding claims, **characterized in** that the hydraulic controller arm (13) has a movability that allows the suction head (1) to be moved sideways or rotated.

21. Device as claimed in anyone of the preceding claims, **characterized in** that the suction force in the suction head (10) is provided by means of an ejector with one or more ejector nozzles arranged angularly (aslant) outside the cross-section of the suction hose (10).

22. Device as claimed in anyone of the preceding claims, **characterized in** that the device is mounted on or comprises a full track chassis (22).

23. Device as claimed in claim 22, **characterized in** that the chassis (22) comprises a platform (23) which is pivotal about a gear rim or the like.